THE CAMBRIAN FAUNAS OF NORTH-EASTERN AUSTRALIA.

PART 5. THE TRILOBITE GENUS *DORYPYGE*.

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(Major R.A.E.).

(Plate XI.)

EXPLANATION.

In Part 3 of this series of papers the polymerid trilobites that had been collected to that date (1939) were described. Since then, as noted in Part 4, very many more trilobites and other fossils have been collected from a series of beds ranging through most of the Middle Cambrian. These beds are exposed in the dissected hilly country east and north-east of Camooweal. Not only did this field excursion bring to light such new and very rich faunas, but for the first time a measured thickness of the beds was followed systematically and a zonal collection made. Previously all fossils had been gathered from widely separated localities, mainly from outcrops of flat beds appearing through the alluvium. The zonal nomenclature that was adopted in the earlier papers, therefore, was based purely on palaeontological evidence. Now, with a measured section as a basis, a direct zonal grouping is possible.

Systematic description of the zonal trilobite faunas (Miomera and Polymera) had begun before the outbreak of war. After my enlistment this had to be discontinued. At that time some of the plates had been prepared and some of the text written. But the only section that was complete, with text, text-figures and plates ready, was this small section on the trilobite genus *Dorypyge*. During a brief period of military leave this isolated fragment has been sent to the press in advance of the main body of the work which must wait until later.

THE HORIZON OF THE *DORYPYGE* BEDS.

The genus *Dorypyge* is a new record for the Cambrian of Australia. When Part 3 was published the genera *Amphoton* and *Nepea* had been found (in association) at one locality only; and a zonal stage (*Amphoton* Stage) had been suggested for them. The subsequent collecting has shown that these two genera range through a considerable portion of the Middle Cambrian.

A lithological vertical section of the local Middle Cambrian limestones exposed along the Camooweal-Burketown road has been published (Whitehouse, 1940, p. 45), and the ranges of some of the trilobite genera indicated. Reference should be made to that for details. The sequence begins (in the late lower Cambrian) with limestones without trilobites. Then *Redlichia* appears, followed by *Xystridura* and other forms, these two genera overlapping for two feet in the section. Just as *Xystridura* dies out, about the end of the first third of the section, *Nepea* and *Amphoton* appear and range through the rest of the observed fossiliferous section. Half way through the range of these two genera the *Papyriaspis-Asthenopsis* fauna makes its appearance; and the species of *Dorypyge* have been collected in the beds containing all four genera towards the end of this faunal stage.

Without further elaboration, which must wait upon the publication of the other faunal evidence, the *Dorypyge* beds may be stated to occur near the top of the fossiliferous beds of this region. How far they are removed from the true top of the Middle Cambrian will not be discussed here.

Recently Resser (1939) has reviewed the Cambrian faunas of the Pacific region and, in my opinion, has overstated the relationships between Australia and Asia. He predicted the appearance, in the Middle Cambrian of Australia, of the curious genera that in present collections are endemic to the Chinese province. It may be stated that recent collecting still has not discovered these in Australia. Rather (as with the genus *Dorypyge*) the new faunas have intensified the common nature of this Province, with its commingling of Asiatic, Cordilleran and Atlantic types that, I suggested (1939, p. 269), was normal for the southerly position of Australia in the Cambrian—a suggestion that Resser seems to have overlooked.

The descriptions that follow were written early in 1941, since when I have been away from all palaeontological literature. Any foreign species of *Dorypyge* that may have been recorded since that date will therefore not be noticed in this paper.

DESCRIPTIONS.

Order Polymera Jaekel, 1909.

Suborder Corynexochida Kobayashi, 1935.

Family DORYPYGIDAE Kobayashi, 1935.

Genus **DORYPYGE** Dames, 1883.

Genotype: *Dorypyge richthofeni* Dames[1].

It is still difficult to decide the generic limits of *Dorypyge*. No complete test of any species of the genus has been figured, so that the number of segments in the thorax is unknown. For most species, too, the free checks and the hypostome have not been recorded. The genotype has a granulate test, six pairs of lateral, pygidial spines, but no spines on the axis of the pygidium. Most of the species that have been placed in *Dorypyge* in recent years have similar characters; but some forms so placed (e.g. *D. danica* Grönwall, 1902, p. 134, pl. 3, figs. 7-12) have a non-granulate surface while others (e.g. *D. oriens* Grönwall, 1902, p. 135, pl. 3, figs. 13-15) have axial pygidial spines as well as a smooth surface. There are more curious species with intermediate characters. *D. lakei* Cobbold[2], for instance, has axial spines, a finely granulate pygidium, granules on the fixed cheeks but, curiously enough, not on the glabella. Some of the smooth forms without axial spines on the pygidium, e.g. *Proetus slatkowskii* Schmidt which von Toll (1896, p. 33, pl. 2, figs. 1-10) referred to *Dorypyge*, are more likely members of the rather earlier genera *Kootenia* or *Notasaphus*.

[1] Dames, although not stating specifically that *D, richthofeni* was the genotype, described only this one species. He did, however, refer two American species to the genus—*Dicellocephalus quadriceps* Hall and *D. (?) gothicus* Hall. Clearly from his description he intended *richthofeni* as the type. This generally has been so regarded by all later workers; and formally it may be nominated as genotype.

[2] Cobbold, 1911, p. 287, pl. xxv, figs. 1-8. See also Lake, 1938, p. 255, pl. xxxvi, figs. 2-12.

At the present time it would be preferable to use the name *Dorypyge* with hesitation for late Middle Cambrian species that have non-granulate tests or axial pygidial spines. Of the remaining forms that, with more confidence, may be left in *Dorypyge* the genotype, *D. richthofen* Dames (1883, p. 24, pl. 1, figs. 1-6), has the most primitive characters, in that there are traces of glabellar furrows, while the lateral ribs of the pygidium are divided by grooves that Lake (1938, p. 251) satisfactorily interprets as rudiments of the original pleural sutures.

Attention may be called to the pair of pits on the axial furrow of the cephalon of most species of *Dorypyge*. Pits in this anterior position, near the junction of the axial furrow and the palpebral ridges, are known in many trilobites. In certain forms, for instance *Dinesus* and the members of the family Nepeidae, anterior grooves radiate from these portions. Such pits or grooves on the surface become elevations on the inside of the test and I would suggest that, like the structures in the axial furrows of the thorax of many trilobites, they mark the place of attachment of muscles. One possible explanation is that they represent the places where the muscles controlling the antennules were attached. One specimen of *Dorypyge tenella* in the present collection is known from an excellent ventral surface of the head; and on it the centre of each elevation (that corresponds ventrally to the pit) bears a central depression.

The species of *Dorypyge* now recorded from Australia are a species group with similarities in such features as the more strongly accentuated fifth pair of pygidial spines and the presence of a sixth (posterior) pair that are mere rudiments. As a group it most closely resembles the Asiatic (Chinese and Manchurian) forms.

It is reasonable to suggest that *Dorypyge* and the similar forms of the later Middle Cambrian with axial spines on the pygidium may be the descendants of *Kootenia* and *Notasaphus* of the early Middle Cambrian. In those two genera, as previously noted (Whitehouse, 1939, p. 241), the stock seems to have differentiated into at least two groups—one (*Notasaphus*) without axial spines on the pygidium and another (*Kootenia*) having such spines. *Dorypyge* therefore may be the successor of *Notasaphus;* and the unnamed group typified by *D. lakei* may be more allied to *Kootenia*. Other variants (e.g. *D. oriens*) seem to have affinities with still other members of that rather variable earlier group. If so, the whole Middle Cambrian assemblage (Dorypygidae) may represent a gradually diverging stock of related forms.

DORYPYGE TENELLA sp. nov.

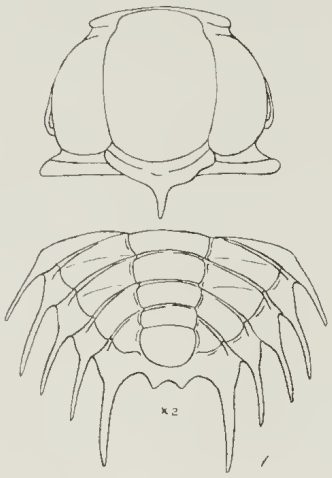
(Pl. XI, figs. 1-5.)

Diagnosis: Cranidium and pygidium ornamented with very fine, closely packed, hollow granules that, however, are absent from the furrows.

The cranidium is subquadrate with a slightly convex anterior margin. The glabella, which is inflated and unfurrowed, has sides that are parallel or only very slightly divergent and a sharply truncate anterior; it reaches almost to the anterior border, the anterior rim being particularly narrow; the axial

furrow is well incised and bears a pair of small pits at the anterior angles. The occipital ring bears a prominent, narrow, hollow spine. The fixed cheeks, in the central region, are slightly more than half as wide as the glabella; the palpebral lobes are only slightly curved, medianly situated and are about half the length of the cephalon; the palpebral ridges are very faint, converging on the anterior corners of the glabella. The anterior limbs of the facial suture are subparallel; the posterior limbs diverge but, near the palpebral lobe, they are subparallel to the posterior cephalic margin.

The pygidium is subtriangular to subcircular in outline. The axis has five segments, the posterior segment being semi-circular in outline and, in the adult forms, is not prominently marked from the one before it. There are five pairs of lateral ribs that are well rounded and sharply separated by narrow furrows. Oblique furrows on the crests of these ribs can faintly be seen on some specimens. There are six pairs of hollow, marginal spines, five of these are long and slender and arise rather abruptly from the lateral ribs while the sixth or posterior pair is but faintly indicated and is situated axially. The four anterior pairs of marginal spines are subequal in size; but the fifth pair is longer and thicker. Each spine arises from a rather thickened base. The doublure of the pygidium is narrow, wire-like, and of uniform width.



No other parts of the test are known with certainty.

Remarks: Fragments of this species representing 15 heads and 20 tails have been examined. Because of the hollowness of the granules, the ventral surface of the test is correspondingly pitted; and on a slightly abraded test the dorsal side may appear finely perforate.

There are a number of species, like *D. tenella,* in which the fifth pair of pygidial spines only are of exceptional size. Of these the most similar forms are the genotype *D. richthofeni* Dames (1883, p. 24, pl. 1, figs. 1-6), *D. pergranosa* Resser and Endo (1937, p. 210, pl. 31, figs. 6-13) and *D. matsushitai* Resser and Endo (1937, p. 210, pl. 43, figs. 22-23). These are the species, all of them from China and Manchoukuo, with which comparison is most pertinent. They have, also, in common with certain other species, the prominent pair of pits at the anterior angles of the cephalic axial furrow. *D. richthofeni* is easily distinguishable by the presence of glabellar furrows and by the coarser ornament. *D. pergranosa* is the most similar species and, indeed, *D. tenella* is to be separated from it only by minor though constant criteria. In general there is a most close agreement between these two species in outline, degree of granulation, type of pygidial spines, and the furrows of the pygidium. *D. tenella,* however, has facial sutures rather more parallel anteriorly, the pygidial spines arise a little more abruptly, and the furrow between the two posterior axial

segments of the pygidium is constantly shown, even though it is faint in the adult—this furrow seems to be eliminated in *D. pergranosa*. Furthermore there seems to be no trace of the faint oblique grooves on the crests of the lateral pygidial ribs in the latter form[3]. *D. matsushitai* differs slightly in the outline of the pygidium.

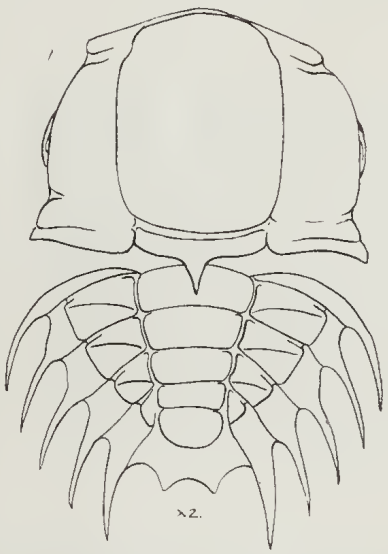
Locality: From beds about four miles east of Douglas Creek on the old Burketown road. (This locality is about three-quarters of a mile west of the type locality for *Anomocare confertum*).

DORYPYGE CORUSCA sp. nov.

(Pl. XI, figs. 8-13.)

Diagnosis: Cranidium and pygidium ornamented with very fine, closely set granules, similar in number and grouping to those of *C. tenella*.

The cranidium is rhomboidal in outline with subangular front. The glabella is subovate, reaching almost to the anterior margin of the head, the sides converging slightly in the anterior region; the axial furrow has a pair of pits at the anterior angles; the occipital ring bears a prominent, hollow spine. The fixed cheeks are narrow (a little less than one-half of the width of the glabella in the central region); the palpebral lobes are long and only slightly curved. The anterior limbs of the facial sutures converge slightly, the posterior limbs are oblique.



The pygidium is subtriangular in outline. The axis has five segments and there are five pairs of lateral ribs that have shallow, oblique furrows on their crests. The last transverse furrow in the axis is not well defined. There are six pairs of marginal spines, the posterior (sixth) pair being very small, the others long. The fifth pair of spines are thicker than the others.

No other parts of the test are known.

Remarks: The material examined consists of fragments of five heads and nine tails.

The species is most similar to *D. tenella*, the chief distinguishing features being the more ovate glabella, the converging facial sutures, the wider axis of the pygidium and the more prominent furrowing of the crests of the pygidial ribs. In these features the species approaches *D. richthofeni* but it lacks the glabellar furrows.

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[3] That is, judging from the figures. The specific descriptions by Resser and Endo are very meagre.

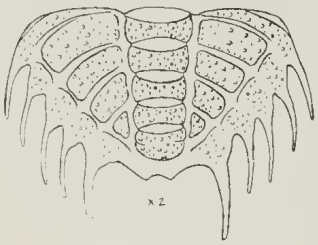
It would seem that the hollow granules are thinner than those of *D. tenella*, for, in most specimens examined, they are worn off leaving pitted surfaces, whereas in *D. tenella* such pitted surfaces were only rarely observed.

Locality and horizon: About three miles east of Douglas Creek on the old Burketown road.

DORYPYGE DECORIS sp. nov.

(Pl. XI, fig. 7.)

Diagnosis: Pygidium subsemicircular in outline, ornamented on the ribs, axial rings and border with relatively widely spaced granules that vary in size. The axis tapers very slowly and is divided into five rings by prominent furrows, the first three of which are relatively wide. The posterior ring is bulb-like and has a faint transverse furrow. There are five pairs of lateral ribs that extend to a wide and prominently differentiated border over which they are faintly continuous to end in long, fine, spines, the posterior pair of spines being rather thicker than the others. From the contours of the one incomplete specimen a sixth (posterior) pair of rudimentary spines is suspected. The crests of the lateral ribs do not bear oblique grooves.



Remarks: Only one specimen, a pygidium, has been collected. The species differs from the two previously described (*D. tenella* and *D. corusca*) in the less tapering axis, the coarser and more widely spaced granules and the wider axial furrows. In granulation and furrows it is somewhat like *D. damesi* Resser and Endo (1937, p. 209, pl. 31, figs. 14-18) but has a narrow, less tapering axis.

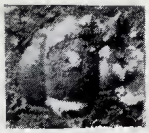
Locality and horizon: About three miles east of Douglas Creek on the old Burketown road.

DORYPYGE sp. ind.

(Pl. XI, fig. 6.)

A fourth species is represented by a fragmentary pygidium that differs from the other three species in having narrower lateral areas with more highly arched ribs.

Locality and horizon: From limestones at the junction of Bull Creek and Douglas Creek.



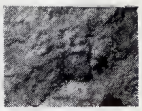
1 a

2 a

3

4

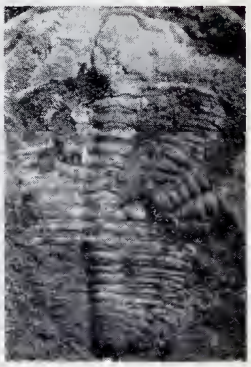
5 a



6

1 b

2 b



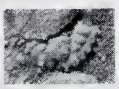
7 a

5 b

7 b

8

10

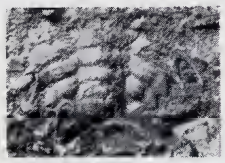


11

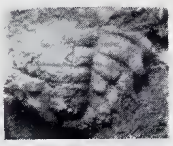
13 b

9

12



13 a



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